SOLAR SYSTEM
ANNOTATED
SAMPLE TEST

Division B Science Olympiad 2014-2015
Sponsored by the University of Texas Institute for Geophysics

TEAM NUMBER:_____
TEAM NAME:_____
STUDENT NAMES:_____
_____

General Advice

The **Solar System** Event entered the rotation of astronomy-based National Science Olympiad B Division events in 2006, and has been a test of general solar system knowledge until 2014, when the event was revised to focus on specific planetary science problems. The event rules currently concentrate study on specific bodies and systems in our solar system recently recognized for their potential habitability and surface and subsurface water systems. Writing a Solar System test for Science Olympiad Invitationals, Regional competitions, and State competitions requires thorough understand of the event subject matter and the relevance and validity of available information to the students, as well as a strong grasp of the testing level of the students and the length and structure appropriate for the test you are writing.

The Solar System objects and phenomena students should be tested on are outlined in this year's official Science Olympiad Rules. These rules should be available from the competition director for which you are writing and/or proctoring a Solar System test. The 2015 Solar System event rules contain no major changes from the 2014 event rules. Not all questions on a given test must pertain to any one concept in the rules, but all should be relevant to the objects and topics outlined in "Part I" and "Part II" of the rules. It is important that tests contain questions challenging both the knowledge of the students both through knowledge-based questions and those that require interpretive understanding and analysis of hypothesized systems. Solar System tests should not be based on "random" trivia, and while detailed quantitative and qualitative information about the objects is is important for the potential habitability and climate systems of the objects, the event should not primarily test students on "random" or obscure information about the objects. As this event focuses on emergent data in a relatively new field of science, recent information (for example, the December 2013 announcement of the evidence of jets on Europa) may be pertinent to the event rules.

There are many resources from which information can be drawn (see Resources and Websites) for writing test questions. It is important to use recent information as the field of extraterrestrial habitability and water is an area of active research and discovery. Questions should be clear and of appropriate level for Invitational, Regional, or State level Competitions. The difficulty of invitational level tests may also depend on how late the invitational is in the competition season. To write a thorough test, one should usually begin writing well in advance of the competition at which the test will be distributed, allowing several days prior to competition for printing and correlation of all tests, image files, answer sheets, and answer keys. Every test should include some questions that every team should be able to answer even after only cursory review of the rules, as well as some questions that demonstrate both extensive research and conceptual understanding of the event material. It is useful to reference the tests from both last year and previous years and note the length, format, and difficulty range of questions on the tests and when in the season the tests were given. Keep in mind the available space on the resource sheets the students may bring in with them and the kind of questions that are direct numerical or identification questions and those that require connections that students must make on the spot based on in depth understanding of the Solar System processes outlined in the rules and their Earth and Exoplanet equivalents.

The format and length of the tests is at the discretion of the test author, though generally the author should consider the number and experience of teams at the competition as well as the amount of time available to score and rank the tests before the awards ceremony. Will students be taking the test at the beginning, throughout, or at the end of the competition? How many teams, and in how many testing blocks, will be taking the test? Will there be volunteers available to distribute and assist in grading tests? If the grading process will be assisted by volunteers, the grading process may be hastened in several ways. Tests should be accompanied by an answer sheet and an answer key of the same format for those grading the tests, and the majority of the test should be in a very short answer or matching format, such that graders have no question as to whether the answer is right or wrong. Occasionally, there may be more than one question on a test with multiple correct answers, or a range of acceptable answers, such as a question about temperature on an object. Sometimes, it may assist both students and graders to include on the answer sheet the intended units for the answer to a question, so students do not have to ask which units to use and graders know immediately if the response is correct or not.

It is often desirable for both the test author and the competitors for Solar System tests to be formatted such that the images referenced in the test are separate from the questions, usually in the form of a powerpoint presentation or image sheets attached to each test. This is how most State and National Solar System tests are formatted. Make sure images are properly labelled to correspond with the questions in which they are referenced, and when distributed or publishing the tests post-competition that all image files for the test are included. Questions style vary, although image analysis and identification questions are part of most, if not all Solar System tests. Matching, multiple choice, fill in the blank, and naming questions are usually the easiest to grade and for students to answer, although no test should consist entirely of these kinds of questions. Typically, tests should include some short answer or explanation questions worth multiple points that the author of the test should grade him or herself. Note that the same person should grade questions of this type on every test, and that if partial points will be awarded for the answer, that the specific elements of the answer worth different amounts of points are allotted prior to grading. A long, well written answer is not necessarily more correct or complete than a more concise one.

Authors of Science Olympiad tests also have many options for distributing the tests. Most test proctors choose not to distribute the raw scores on their tests from competitions or return the graded tests to the competitors. However, most teams receive a blank copy of the test and an answer key, either physically or digitally, after invitational competitions. Some proctors choose to publish these tests and keys on the online test exchange of SciOly.org (see Resources & Websites). Generally, tests from Regional and State Competitions are not released due to potential debate over team ranking and corrector acceptable answers.

Resources & Websites

Material and information resources are available on the Science Olympiad National Corporation Inc. website on the event page for the Solar System Event:

http://soinc.org/solar_b

Further resources and example tests, including last year's National Test, are available on the Solar System Event Website hosted by UTIG:

http://www.ig.utexas.edu/research/planetary/outreach/

As well as the website for this year and last year's event hosted by the American Association of Variable Star Observers:

http://www.aavso.org/science-olympiad-2015

http://www.aavso.org/science-olympiad-2014

Tests from some invitationals and written by students, organized by year, are available on the forum-style Science Olympiad website, SciOly.org Test Exchange:

http://www.scioly.org/wiki/index.php/Category:Test_Exchange

Note that, although Solar System tests are usually in no particular order in terms of question type and subject, this annotated sample test and accompanying unannotated test will feature questions sorted and by subject and question type to assist test authors.

IMAGE AND FEATURE ID

Image and Feature ID should ideally be integrated into all parts of a test, and all types of questions can stem from identification or analysis of relevant images. Questions should both ask students to identify images and reference the images as aides in answering the questions. Most often Image and Feature ID is relevant to questions addressing section i. of Part II of the rules. Although students are not expected to know every astronomical instrument for gathering data, they should be familiar with the most important instruments and missions as well as the general principals behind making measurements such as gravity, magnetic field, surface composition, density, albedo, etc. of the objects. Students should be familiar with which of these can be directly measured and which are derived measurements. Various image sizes, resolutions, and ages may be appropriate for different questions, as is evident in the sample test available online. Note that illustration for some things (Oort Cloud, Europa thin-shell thick-shell models, etc.) is only available in the form of artist's conception. Keep in mind the medium used for the images; will they be projected in a slideshow? Will they be printed in color or black and white?

Check that all image lettering matches the answer key and the questions that reference the images in the final version of the test. For Nationals, the usual labeling scheme for images is A-Z, with additional images being labelled AA, BB, and so on, so you may wish to follow a similar scheme to prepare students for the National Exam.

Match the physical feature with the body with which it is associated:

1. Cantaloupe Terrain	A. Mars Glacial Region
2. Kuiper Cliff	B. Europa
3. Equatorial Ridge	C. Europa
4. Plages	D. Asteroid Belt
5. Hills Cloud	E. Kuiper Belt
6. Kraken Mare	F. Triton
7. The Piazzi Bright Spot	G. Titan's North Pole
8. Kirkwood Gaps	H. Titan's South Pole
9. Baghdad Sulcus	I. Earth
10. Ismenius Lacus Quadrangle	J. Sun
11. Conamara Chaos	K. Iapetus
12. Ontario Lacus	L. Ceres
13. Ion Tail	M. Comets
14. Asthenosphere	N. Oort Cloud
15. Udaeus Lineae	O. Enceladus

Refer to Image Set A for Questions 16-39

16. Name the Solar System object in Image A. Write the name of the mission that took this image.
17. Name the Solar System object in Image B. Write the name of the mission that took this image.
18. Name the Solar System object and region of this object pictured in Image C. Write the name of the mission that took this image.
19. Name the Solar System object in Image D. Write the name of the mission that took this image.
20. Name the Solar System object in Image E. Write the name of the mission that took this image.
21. Name the Solar System object in Image F. Write the name of the mission that took this image.
22. Which image was taken from the surface of an object beyond the Asteroid Belt?
23. The probe that took this image landed in what relatively deserted and barren region of the object?
24. What two objects are shown in Image Y?
25. Which image shows the North Pole of this Object?
26. Image G is a composite image comprised of data from which two spacecraft?
27. Which other image shows the same object as Image G?
28. Images M and N show the poles of which object?
29. If red shows higher elevations and blue shows lower elevations, which of these images, M or N, shows the NORTH pole of this object?
30. Which object is shown in Image Z? What is the albedo of the white material? What is the albedo of the dark material?
31. Which object is shown in Image J?
32. The plasma flows around the object depicted in Image J show the effects of what anomalously strong characteristic of this object?
33. Which image shows cratering on this object?
34. Which image shows the planet around which Triton orbits?
35. Triton, along with many other large natural satellites, revolves such that one hemisphere always faces its host planet. What is this phenomenon called?
36. Which image shows Permafrost on the surface of Mars?
37. Which image shows evidence of glaciers on the surface of Mars?
38. Most Earth glaciers are located near the poles. How is this different from evidence of glacial movement left on the surface of Mars?
39. What is the primary constituent of Mars' atmosphere?

Questions about history of the objects and systems outlined in the rules and their discovery and validation are both important parts of a complete test. These questions are an increasingly common component of Science Olympiad events in both B and C Division because they encourage competitors to think critically about how established scientific "facts" are discovered and validated, as well as how they are potentially challenged and changed over the years.

HISTORY & DISCOVERIES

Matching and short answer questions are common in this section. Questions about years of discovery, launch, or study are typically easy for students to answer from their own research. Depending on the time of specific event, it may not be unreasonable for students to know an exact date of discovery or launch, whereas other dates must be accepted with an error of 1-2 years due to conflicting available sources and lack of reliable historical records, so answer key margins for error must reflect the precision to which dates are expected to be known. This section should comprise a relatively small section of the test, as critical thinking and analysis should have a greater impact on the students' score than recalling facts or "trivia" less relevant to the actual planetary science.

Match the person or man-made satellite with the accomplishment/discovery it made, and write in the year of discovery on the answer key:

40. Thrace Macula	A. Galileo Galilei
41. Iapetus Equatorial Ridge	B. Giuseppe Piazzi
42. Ceres	C. *Galileo*
43. Water jets on Europa	D. *Cassini Orbiter*
44. Europa	E. Surface Science Package
45. 72-year period comet	F. Giovanni Domenico Cassini
46. Landed on Titan	G. Curiosity Rover
47. Iapetus Color Dichotomy	H. Huygens Probe
48. Liquid Lakes on Titan's Surface	I. Hubble Space Telescope
49. Triton	J. William Lassell
50. Enceladus's Magnetic Field	K. Cassini Magnetometer
51. Evidence of Flow in Gale Crater	L. David Jewitt & Jane Luu
52. First Kuiper Belt Objects	M. Edmund Halley

This question gives students who only know some of the answers the opportunity to critically analyze the remaining choices and potentially get points for the question. Also, if students know only the year of discovery, they will still get some points.

53. Write the names of all the currently classified Dwarf Planets in the Solar System.
54. How old is the Solar System? How old is the Universe?
55. What is the name for the period of Solar System activity in which most natural satellites acquired their largest craters?

56. There have been 4 successful Mars Rovers. What are their names?
57. What is the name of the bulge on Mars that may indicate a large impact some 3 billion years ago? What is the name of the large canyon that may have been formed as a result of the same event?
58. Any impact crater left as a result of this collision that caused the dichotomy may have been covered by volcanic activity. However, Olympus Mons, the largest volcano on Mars, only began forming 1 billion years ago. What 3 other large volcanoes overlying the bulge in question **57** are thought to be responsible for covering this hypothesized crater?

Relevant information about past, current, and future missions is often the most challenging for both students and proctors to distinguish from irrelevant information, as there is no clear line that dictates which missions or which instruments comprising those missions are directly relevant to studies of water and habitability in the solar system as outlined in the rules. One of the website links available on the Solar System Event Page on the National Science Olympiad Website, JPL Infographics, has especially relevant information about missions past, present, and future and the discoveries and data collection capabilities of different missions on different objects.

PAST, CURRENT, & FUTURE MISSIONS

Refer to Image Set B for Questions 59-62. For Images P-S, write the name of the mission, the year it was launched, and whether or not it is still in active use (yes/no).

59. Image P
60. Image Q
61. Image R
62. Image S

Match the destination of the mission with its name. On the answer key, write in the year of launch:

63. Rosetta	A. Mars
64. OSIRIS-REx	B. Europa
65. MER (Spirit & Opportunity)	C. 25143 Itokawa
66. Hayabusa	D. 101955 Bennu
67. JUICE	E. 67P Churyumov/Gerasimenko
68. Europa Clipper	F. Jupiter

Be careful with questions about timelines for progress of future missions because timescales for these missions tend to change frequently. When used on a test, answers should reflect the most recent official statement made on the date of launch.

69. InSight is a mission to Mars proposed to launch in 2016. This mission is different from other missions to Mars in that it will primarily study which area of Mars?
70. The Mars Reconnaissance Orbiter is equipped with a suite including 3 basic types of instruments designed to analyze landforms, stratigraphy, minerals, and ice of Mars, but it does not actually land on the surface. What are these three kinds of instruments?
71. Why is the JUNO Mission set to arrive near Jupiter in 2016 not of direct significance to scientists studying Io, Europa, Ganymede, and Callisto?

72. What is the typical sequence of mission types used by NASA to explore a planetary body? Use these terms: Lander, Probe, Flyby, Sample Return Mission, Orbiter, Rover.
73. The Dawn Mission has been launched to study which two large asteroids? What are the names of the other two largest asteroids in the asteroid belt (all four of which comprise nearly half the total mass of the asteroid belt)?

This general section of objects outlined in the rules generally have less available direct images but relatively more well-established data and physical samples collected, and in general are conceptually simpler and understood. This section presents an opportunity to intersect one a historically significant aspect of classical astronomy with cutting edge planetary science research and missions (DAWN, OSIRIS-REx, etc.).

COMETS, ASTEROIDS, OORT CLOUD, & KUIPER BELT

74. Refer to Image V. The distribution of what kind of objects are shown in this graphic?
75. What are the spaces in this distribution called? Which Image, T or U, better shows their relative positions?
76. What do the numbered positions 1, 2, 3, 4, 5 in Image V indicate?
77. The gravitational influence of the objects located at which two numbers from the diagram causes the uneven distribution of objects shown in the graph?
78. Which asteroid could be considered an "embryonic planet" because it was never able to accrete matter to its full potential?
79. This object and others in the asteroid belt were predicted before they were observed due to the "gap" in Solar System Orbital distances where another planet was expected to have formed. What law of ratios in the Solar System predicted its formation in this position?
80. Are Trojans more similar to asteroids or comets? How many Trojans does each planet have?
81. What are the names of the four "families" or Near Earth Asteroids?
82. Most asteroids can be divided into C, M, or S types based on composition. What do each of these letters stand for?
83. Refer to Image DD. Label the parts of a comet on your answer sheet.
84. Which three lettered regions of Image EE represent the "Planetary Boundary", "Kuiper Belt", and "Inner Oort Cloud", respectively?

Questions regarding phase diagrams and habitability often require students to reference direct numerical data and a comparatively greater amount of raw information from their resource sheets than other topics. This often includes analyzing water or other substances in the atmosphere, on the surface, or below the surface of the different objects. As pure recall information is not the goal of these questions, it is common for questions to build off earlier questions, a common theme in higher level Science Olympiad tests. However, given that there is not enough time in grading to evaluate how students arrived at an answer for each step of such a question, those where propagating errors could effect a significant number of later questions are discouraged. Quantitative questions about the crystalline structures of water should be considered more qualitatively, noting especially that students are not allowed calculators during the event.

As the Solar System event requires a strong foundation of understanding of motions and energy in the Solar System in general, some more physics-related questions may be incorporated into Solar System tests and generally fit best with these kinds of questions.

PHASE DIAGRAMS & HABITABILITY QUESTIONS

Match the suspected composition of the subsurface ocean with the body it is associated with:

85. Ceres	A. various salts, H_2O
86. Triton	B. NH_3, H_2O
87. Titan	C. H_2O_2, H_2O
88. Europa	D. NaCl, H_2O
89. Enceladus	E. C_2H_6, CH_4, H_2O

The above question requires knowledge of the suspected ocean composition of the objects, and potentially knowledge of the chemical formulas for some of the most common compounds scientists research in the study of habitability.

90. Which object from the rules has the highest average surface temperature?
91. Which object from the rules contains the highest hypothesized amount of *liquid* water?
92. Which object from the rules has a surface pressure most similar to that of Earth?
93. Which object in the from the rules has the highest albedo? What is it?
94. The presence of what substance on Titan allows some water to remain liquid down to -97 C, a “eutectic” condition?
95. The Earth’s atmosphere has 5 layers: exosphere, thermosphere, stratosphere, mesosphere, and troposphere. Which of these two are also found in Titan’s atmosphere?
96. What do the green regions in Image H indicate?
97. What does the fine green line in Image H indicate?

98. The snowflake symbols in Image H indicate the location of what boundary for each star system?

By referencing Image H, the fine green line that represents habitability conditions for Earth around different stars could easily be hard to distinguish if the image was printed in black and white or in low resolution, so the proctor should keep this in mind when deciding how large of images and details may be referenced easily by the students.

99. Which 4 chemicals are considered the "building blocks of life"?

100.Which object has an atmosphere thick enough and low enough surface gravity that a human being could fly using prosthetic wings?

101. The Earth is transported to be 4 AU from the Sun. What is the ratio of the total solar flux the Earth receives from the Sun before it is moved to after it is moved?

102. A satellite in synchronous rotation orbits around its host planet with a period of 19 days. What is the period of radial rotation of the satellite?

103. An Amor asteroid is the solar system orbits the Sun at an average distance of 4 AU. What is its period in years?

104. What is the name for the relatively radio-quiet band between 18 and 21 cm lines in the radio region of the electromagnetic spectrum thought for several reasons to be a key band for detection of signals indicating extraterrestrial life?

105. Look at Image GG, a phase diagram of Carbon Dioxide. What physical state would water be in when Carbon Dioxide is at its triple point?

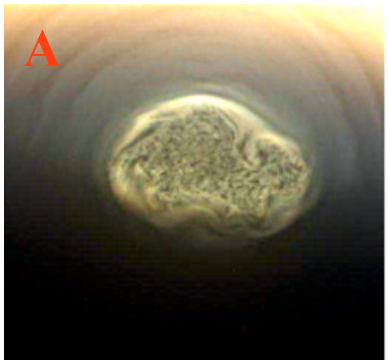
106. The surface spectrum of an object from the rules is shown in magenta in Image II. Based on the comparison spectra shown in Image HH, what does the blue line represent the spectrum of?

107. Which two objects might the magenta line be the surface spectrum of?

IMAGE SET A

It is best to label image sheets if there are more than one, so that students save time looking for images referenced in the questions. This can aid in sorting the images by question type i.e. images of surface features on one page and images of missions and spectral features on another page. By instructing students to draw from a particular image set in which all the images are relevant to a single theme or concept for some section of the test, this eliminates the possibility of other images as incorrect multiple choice options.

A



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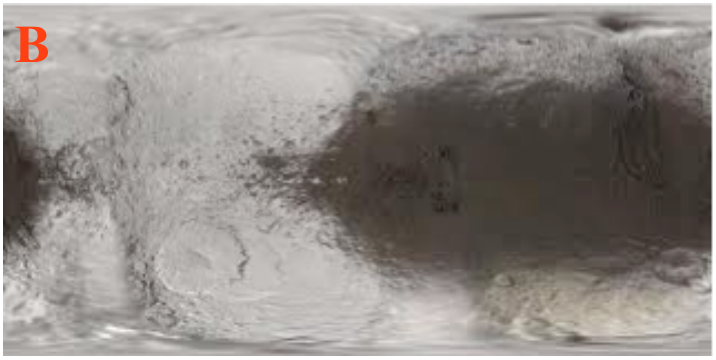

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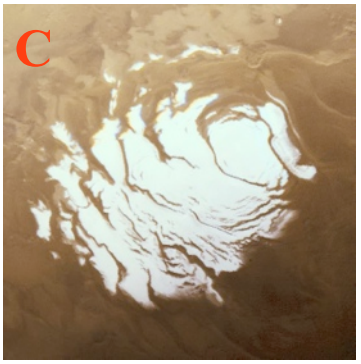

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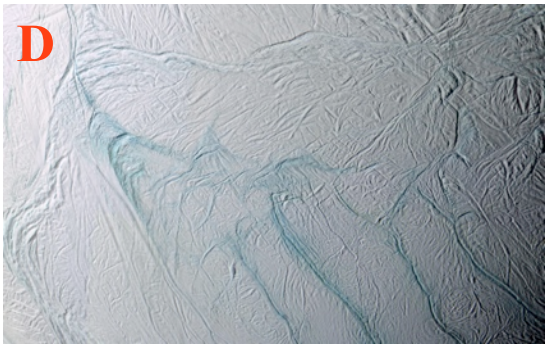

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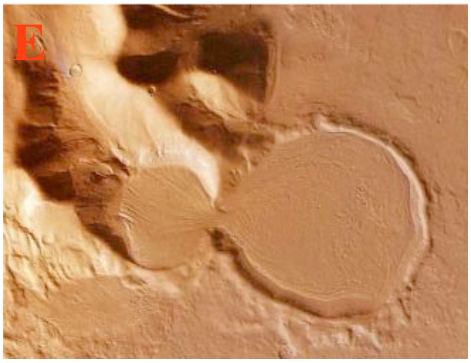

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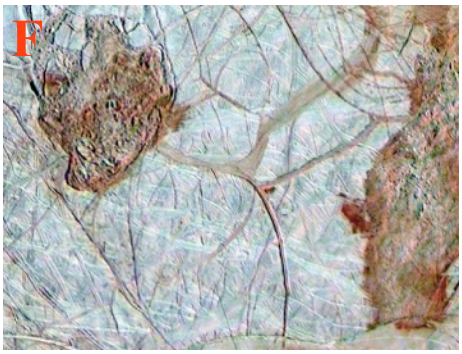

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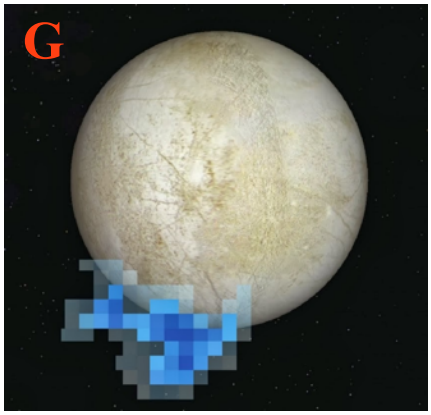

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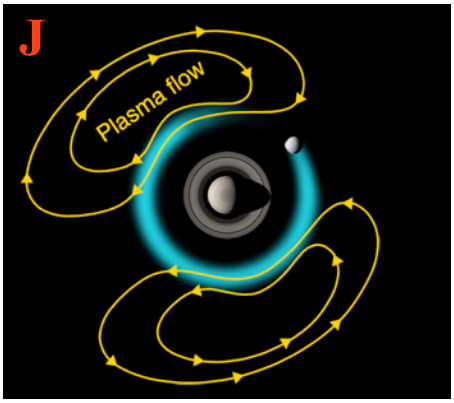

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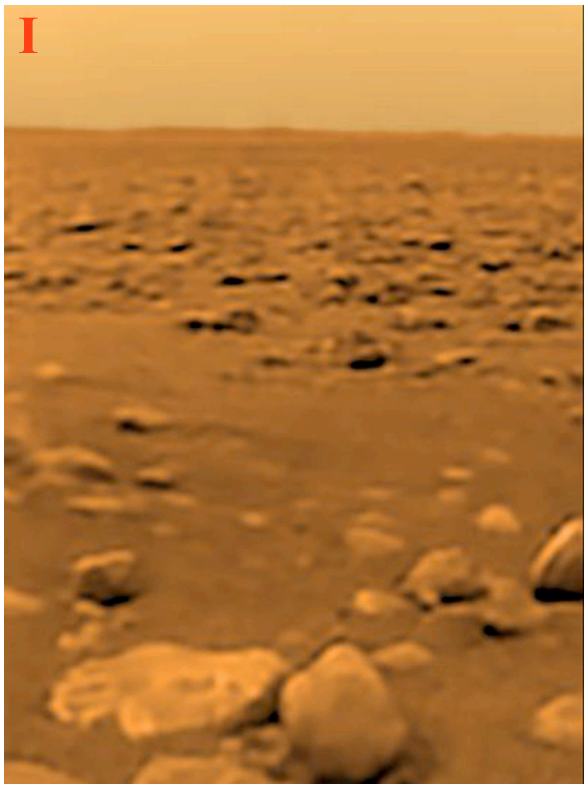

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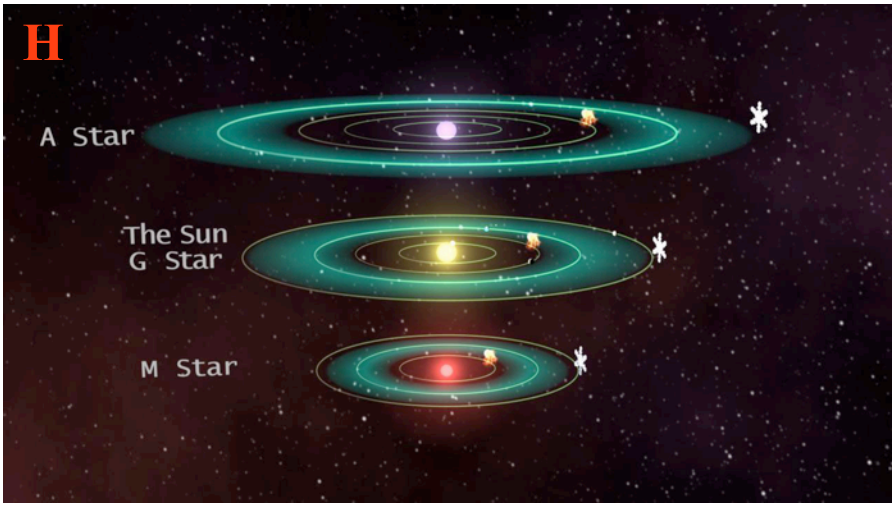

IMAGE SET A CONTINUED

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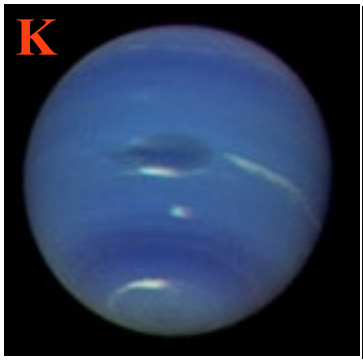

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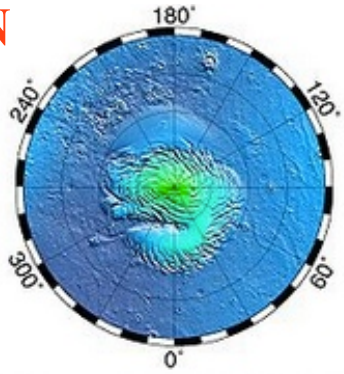

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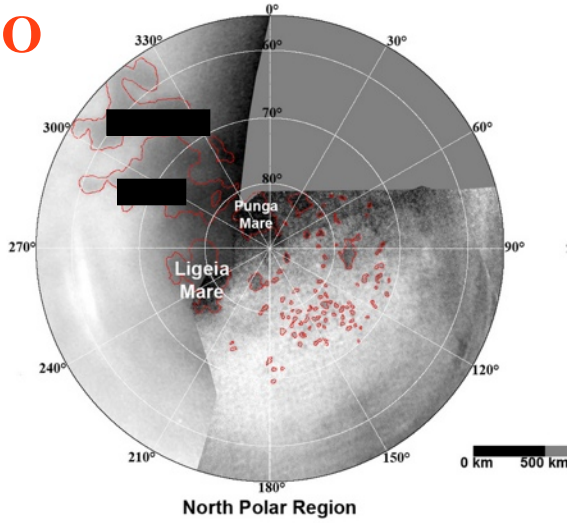


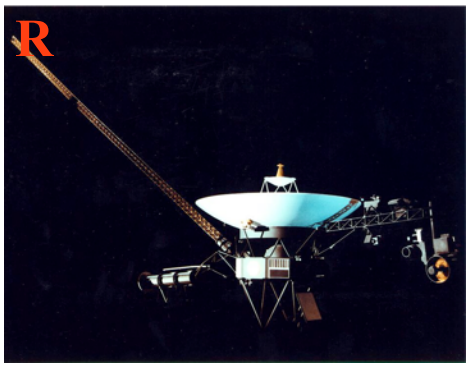
North Polar Region

IMAGE SET B

P

Q

R



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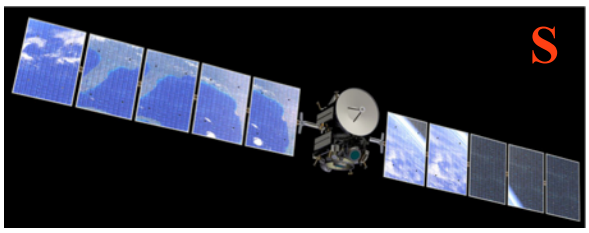

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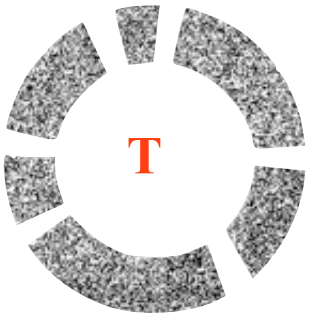

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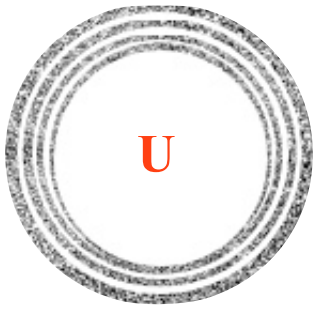

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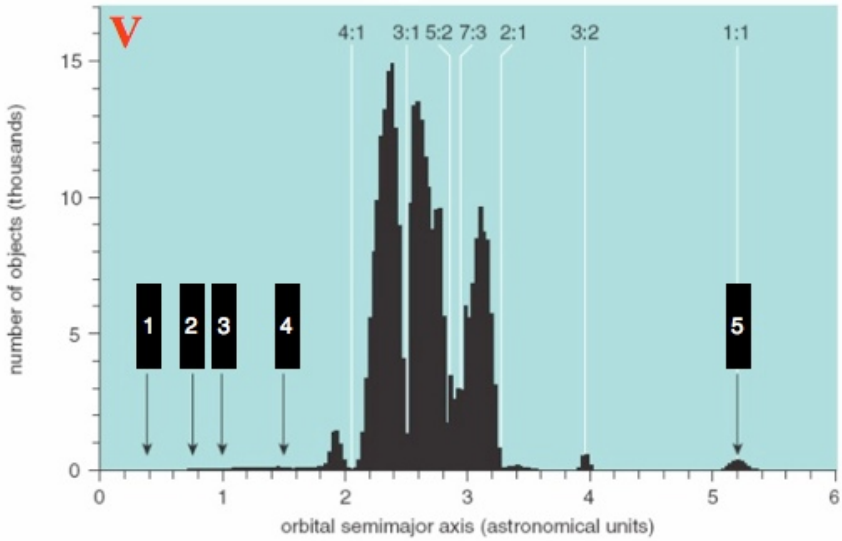

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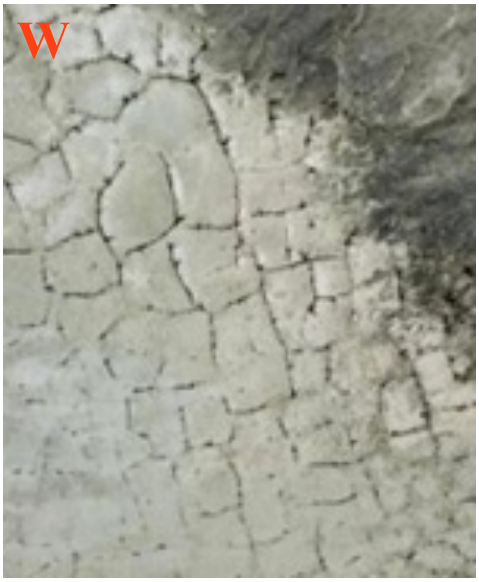
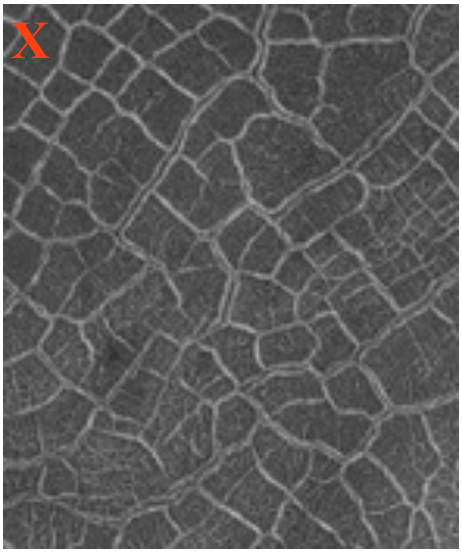
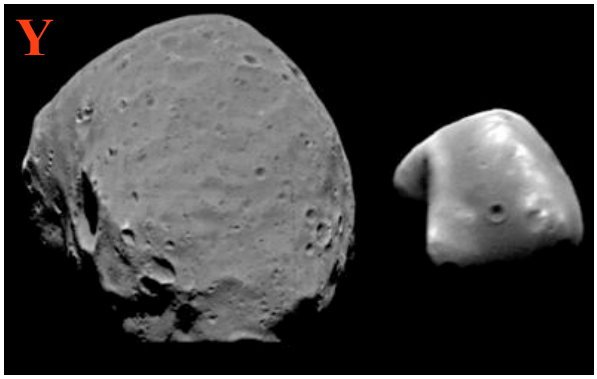


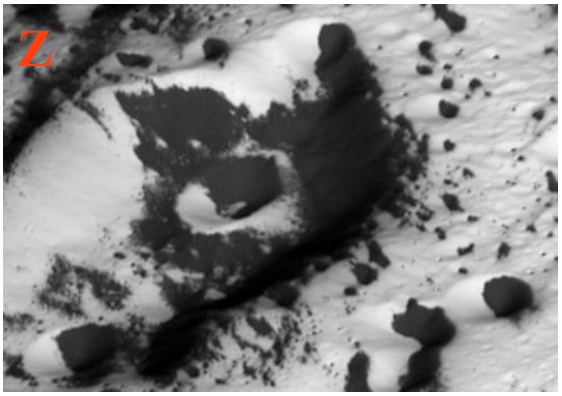
X



Y



Z



AA

BB

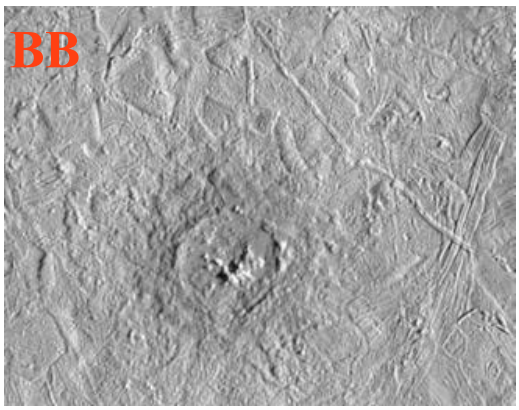
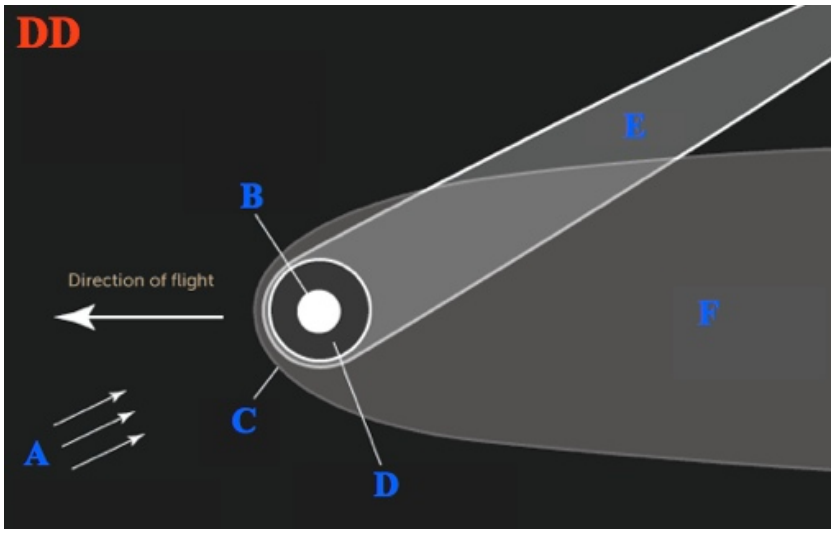
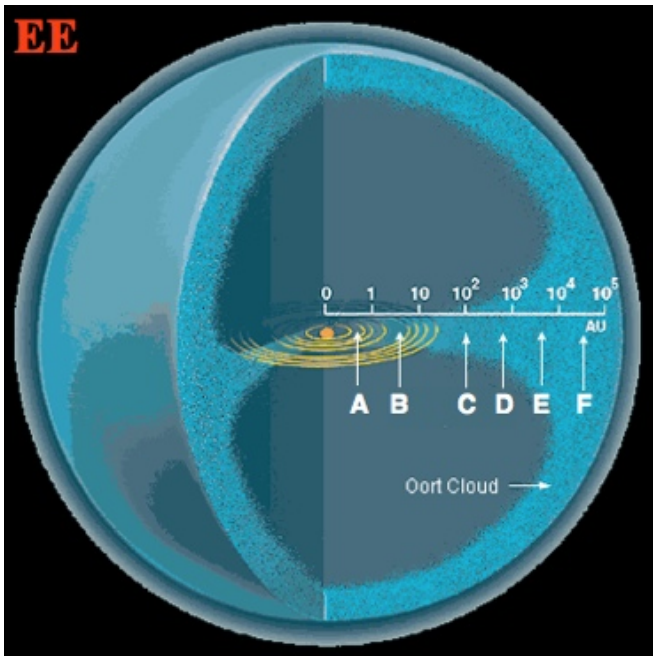


IMAGE SET C

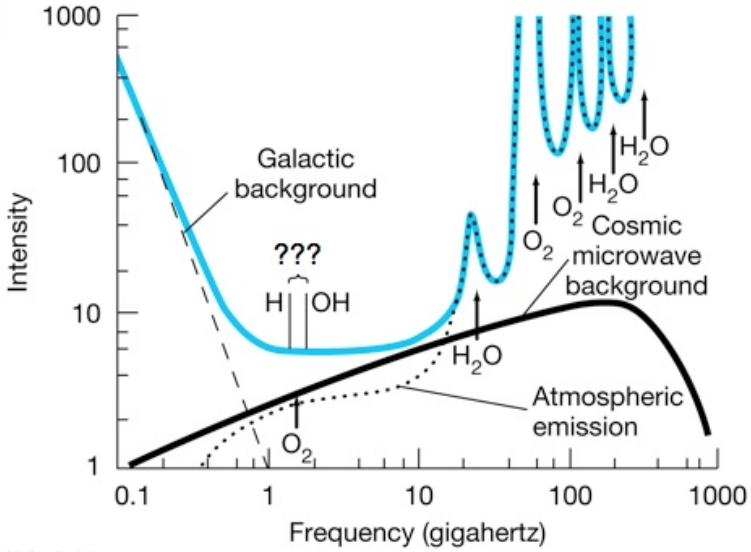
DD



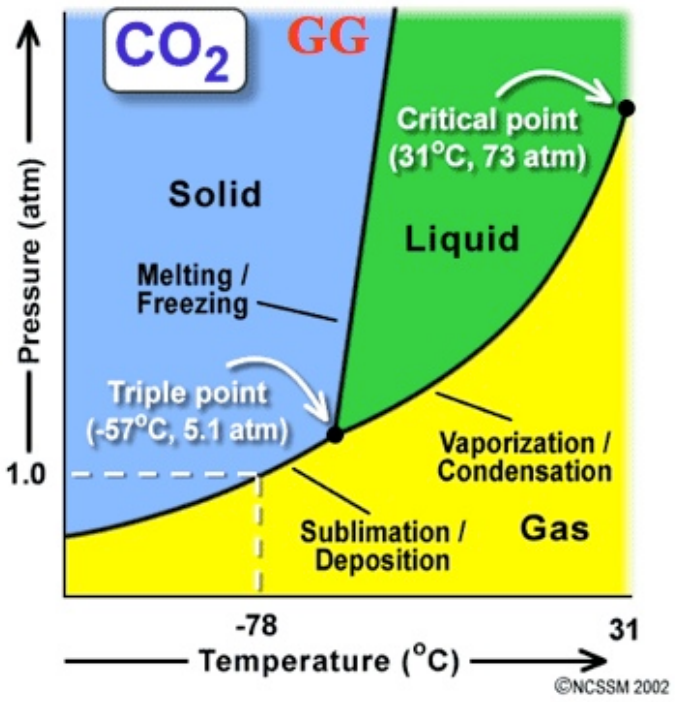
EE



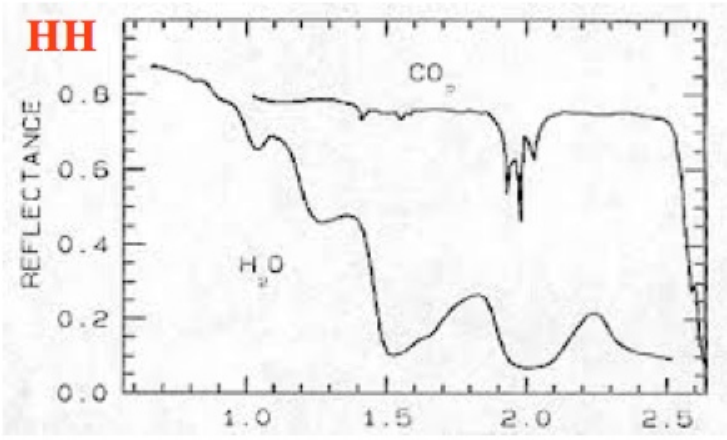
FF



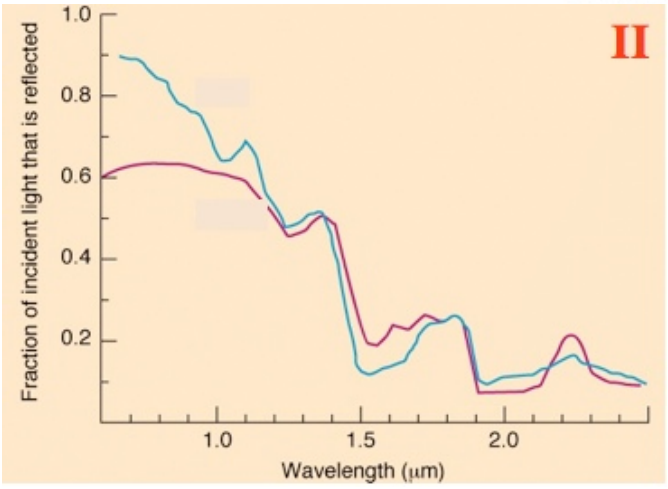
GG



HH



II



ANSWER KEY

TEAM NUMBER: KEY TEAM NAME: KEY SCORE: _____/_____= 100%

It is typically a good idea to include space for team number and name on all answer sheets, in case tests become disorganized, and in case there is some confusion with team numbers.

A key should usually be printed and recorded in the same format as the test answer sheets to speed the grading process and assist any volunteer graders who may be working with you grading tests. Efficiency is especially important when a large number of tests must be graded and ranked in time for the awards ceremony. Note that a different amount of space is allotted for different questions to assist students in keeping track of answers. It is important to provide answer spaces large enough for larger handwriting. It is highly recommended that a test author take his or her own test to check for inconsistencies in numbering, oddly phrased questions, and inconveniences like answer spaces that are not large enough for adequate answers to be comfortably provided.

1. F
2. E
3. K
4. J
5. N
6. G
7. L
8. D
9. O
10. A
11. B or C
12. H
13. M
14. I
15. B or C
16. Object: Titan
    Mission: Cassini
17. Object: Iapetus
    Mission: Cassini
18. Object: Mars
    Region: South Pole
    Mission: Mars Polar Lander
19. Object: Enceladus
    Mission: Cassini
20. Object: Mars
    Mission: Mars Express Orbiter
21. Object: Europa
    Mission: Galileo
22. Image I
23. Xanadu Region
24. Phobos & Deimos
25. Image O
26. Galileo & HST
27. Image F
28. Mars
29. Image N
30. Iapetus
    0.5, 0.05
31. Enceladus
32. Magnetic Field
33. Image AA
34. Image K
35. Synchronous Rotation
36. Image X
37. Image E
38. Equatorial Glacial Region
39. CO_2
40. C
41. D
42. B
43. I
44. A
45. M
46. H
47. F
48. E

ANSWER KEY

TEAM NUMBER: KEY TEAM NAME: KEY SCORE: _____/_____= 100%

49. J
50. K
51. G
52. L
53. Pluto, Ceres, Haumea, Makemake, Eris
54. 4.6 billion years
    13.8 billion years
55. Late Heavy Bombardment
56. Curiosity, Spirit, Opportunity, Sojourner
57. Tharsis Bulge, Valles Marineris
58. Pavonis Mons, Ascreaus Mons, Arsia Mons
59. Cassini Mission
    Year: 1997
    Y/N: Yes
60. Curiosity Rover
    Year: 2011
    Y/N: Yes
61. Voyager II
    Year: 1977
    Y/N: Yes
62. Dawn Mission
    Year: 2007
    Y/N: Yes
63. E
64. D
65. A
66. C
67. F
68. B
69. the interior of Mars
70. Camera, Spectrometer, Radar
71. It will be orbiting Jupiter inside their orbits
72. Flyby, Orbiter, Probe, Lander, Rover, SRM
73. Dawn: Vesta
    Ceres
    Other 2: Pallas
    Hygeia
74. Asteroids
75. Kirchoff Gaps, Image U
76. Orbital distances of the 5 inner most planets
77. 4 & 5
78. Ceres
79. Titius-Bode Law
80. Asteroids
    Mercury: 0
    Venus: 0
    Earth: 1
    Mars: 5
    Jupiter: 5884
    Saturn: 0
    Uranus: 1
    Neptune: 9
81. Amors, Atens, Apollos, Atiras
82. C: Carbonaceous
    M: Metallic
    S: Silicaceous
83. A: Solar Wind
    B: Rocky Core
    C: Coma
    D: Ice & Frozen Gases
    E: Ion Tail
    F: Dust Tail

ANSWER KEY

TEAM NUMBER: KEY TEAM NAME: KEY SCORE: _____/_____= 100%

84. B, C, D
85. C
86. B
87. E
88. A
89. D
90. Mars
91. Titan
92. Titan
93. Enceladus
    0.99
94. Ammonia
95. Stratosphere,
    Troposphere
96. Habitable Zone
97. Earth Conditions
98. Snowline (or Frostline)
99. Water, Ammonia,
    Methane, Hydrogen
100. Titan
101. 1/16
102. 19 days
103. 8 years
104. Water Hole
105. Solid or Ice
106. Ice
107. Enceladus,
     Europa

ANSWER SHEET 1

TEAM NUMBER:_____ TEAM NAME:_____ SCORE: _____/_____=_____

1._____
2._____
3._____
4._____
5._____
6._____
7._____
8._____
9._____
10._____
11._____
12._____
13._____
14._____
15._____
16. Object:_____
    Mission:_____
17. Object:_____
    Mission:_____
18. Object:_____
    Region:_____
    Mission:_____
19. Object:_____
    Mission:_____
20. Object:_____
    Mission:_____
21. Object:_____
    Mission:_____
22. _____
23. _____
24. _____
25. _____
26. _____
27. _____
28. _____
29. _____
30. _____
    _____,_____
31. _____
32. _____
33. _____
34. _____
35. _____
36. _____
37. _____
38. _____
39. _____
40. _____
41. _____
42. _____
43. _____
44. _____
45. _____
46. _____
47. _____
48. _____

ANSWER SHEET 2

TEAM NUMBER:_____ TEAM NAME:_____ SCORE: _____/_____=_____

49. _____
50. _____
51. _____
52. _____
53. _____
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54. _____
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55. _____
56._____
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57. _____
_____
58._____
_____
59. _____
Year: _____
Y/N:_____
60. _____
Year: _____
Y/N:_____
61. _____
Year: _____
Y/N:_____
62. _____
Year: _____
Y/N:_____
63. _____
64. _____
65. _____
66. _____
67. _____
68. _____
69. _____
70. _____
_____
71. _____
_____
72. _____
_____
_____
_____
73. Dawn: _____
_____
Other 2: _____
_____
74. _____
75. _____
76. _____
_____
77. _____
78. _____
79. _____
80. _____
Mercury:_____
Venus: _____
Earth: _____
Mars:_____
Jupiter:_____
Saturn:_____
Uranus:_____
Neptune:_____
81. _____
_____
82. C:_____
M:_____
S:_____
83. A:_____
B:_____
C:_____
D:_____
E:_____
F:_____

ANSWER SHEET 3

TEAM NUMBER:_____ TEAM NAME:_____ SCORE: _____/_____=_____

84. _____
85. _____
86. _____
87. _____
88. _____
89. _____
90. _____
91. _____
92. _____
93. _____
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94. _____
95. _____
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96. _____
97. _____
98. _____
99. _____
_____
100. _____
101. _____
102. _____
103. _____
104. _____
105. _____
106. _____
107. _____
_____